

CLAIMS

I Claim

1.) A process for incorporating nanoparticles into a polymer melt comprising the steps of;

- (i) providing a molecularly disentangled polymer melt,
- (ii) providing a material that comprises nanoparticles,
- (iii) transferring the disentangled melt and the material to a means for blending the material with said disentangled melt, and
- (iv) blending said polymer melt with said material,

in which said material is in a form selected from the group consisting of powder, pellets, liquid and a blend of any of the preceding.

2.) The process of claim 1 in which the polymer melt is selected from the group consisting of ethylene propylene copolymer, high-density polyethylene, high-impact polystyrene, low-density polyethylene, polyamide, polyacrylic acid, polyamide-imide, polyacrylonitrile, polyarylsulfone, polybutylene, polybutadiene acrylonitrile, polybutadiene styrene, polybutadiene terephthalate, polycarbonate, polycaprolactone, polyethylene, polyethyl acrylate, polyetheredierketone, polyethylene sulfone, polyethylene terephthalate, polyethylene terephthalate glycol, polyimide, polyisobutylene, polymethyl acrylate, polymethyl ethyl acrylate, polymethyl methacrylate, polyoxymethylene (polyacetal), polyphenylene ether, polyphenylene oxide, polyphenylene sulfide, polypropylene terephthalate, polystyrene, polytetrafluoroethylene, polyurethane, polyvinyl alcohol, polyvinyl acetate, polyvinyl chloride, polyvinylidene chloride, polyvinylidene fluoride, polyvinyl methyl ether, polyvinyl methyl ketone, styrene butadiene, styrene butadiene rubber, cellulose acetate, cellulose acetate butyrate, cellulose acetate propionate, cellulose nitrate (celluloid), chlorinated polyethylene, chlorotrifluoroethylene, ethylene acrylic acid, ethylene butyl acrylate, ethyl cellulose, and polymers and copolymers of acrylonitrile butadiene acrylate, acrylonitrile butadiene styrene, acrylonitrile, chlorinated PE and styrene,

acrylonitrile methyl methacrylate, acrylonitrile, acrylonitrile styrene, acrylonitrile, butadiene acrylonitrile, ethylene propylene diene monomer, and blends or copolymers of the preceding.

3) The process of claim 1 in which said molecularly disentangled melt has been provided by processing a polymer melt in a Tek Flow processor.

4.) The process of claim 1 in which said means for blending comprises a step selected from the group consisting of continuous extrusion, batch blending, and a means for molecularly disentangling polymer chains.

5.) The process of claim 4 in which the means for molecularly disentangling polymer chains comprises a Tek Flow processor.

6) The process of claim 4 in which said means for molecularly disentangling polymer chains comprises the step of subjecting the polymer to a mechanical vibration at a frequency of up to 100Hz.

7.) The process of claim 6 in which the means for molecularly disentangling the polymer chains further comprises the step of subjecting the polymer to extensional flow.

8.) The process of claim 4 in which the means for molecularly disentangling the polymer chains comprises the step of subjecting the polymer to shear.

9.) The process of claim 8 in which the means for molecularly disentangling the polymer chains further comprises the step of subjecting the polymer to extensional flow.

10.) The process of claim 1 in which said blending step takes place at a temperature that is at least 20° C below the conventional melt temperature range of the polymer.

11.) A product that comprises at least one polymeric material and nanoparticles, said product being made by the process of

- (i) providing a molecularly disentangled polymer melt,
- (ii) providing a material that comprises nanoparticles,
- (iii) transferring the disentangled melt and the material to a means for blending the material with said disentangled melt, and
- (iv) blending said polymer melt with said material,

in which said material is in a form selected from the group consisting of powder, pellets, liquid and a blend of any of the preceding.

12) The product of claim 11 in which said molecularly disentangled melt has been provided by processing the polymer melt in a Tek Flow processor.

13.) The product of claim 11 in which the blending of the polymer melt with the material takes place in a Tek Flow processor.